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The Pantheism of Modern Science...

BY

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THE PANTHEISM OF MODERN SCIENCE.

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TORONTO, CANADA.

A SUMMARY OF RECENT INVESTIGATIONS

Into Life, Force and Substance,

AND THE

OPINIONS BASED BY SCIENTISTS THEREON,

LEADING UP TO THE CONCLUSION

THAT THERE IS

IN NATURE A UNIVERSAL MIND CONTROLLING AND PERMEATING NATURE'S MANIFESTATIONS.

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Introduction.

In his introduction to "Studies in Spectrum Analysis," Sir Norman Lockyer points out that a change of scientific opinion is a healthy sign, indicating research and progress. He says: "The work of the true man of science is a perpetual striving after a better and closer knowledge of the planet on which his lot is cast, and of the universe in the vastness of which that planet is lost. The only way of doing this effectually is to proceed as gradually, and therefore as surely as possible, along the dim untrodden ground lying beyond the known."

After instancing a few of the rich harvests of knowledge which had been gathered from an exceeding small germ of thought, he continues, "Each step of this kind has more firmly knit the universe together, has welded it into a more and more perfect whole, and has enhanced the marvelous beauty of its structure. Science can never be so flourishing as when she is changing her opinions, because her opinions can never be changed unless she has acquired a number of new truths."

The closing part of this century has been remarkable for the diligence with which our scientists have scrutinized every phenomenon of nature and the immense fund of fresh facts which has rewarded their researches. We need not, therefore, be surprised to find that some very radical changes have taken place in the opinions held by the leading exponents of scientific thought in reference to the nature of those sources from which phenomena are produced.

These changes of thought, so far as the main body of scientific opinion is concerned, are usually so gradual in their operation that the movement is imperceptible until it is accomplished. Looking back over the records of years in which radical changes have been made, it is impossible oftentimes to lay the hand upon the time when the transition from the old to the new first became an established fact. There is a gradually dawning recognition of the truth. At first tentatively put forward, it commends itself to an ever increasing number, until, without any show of hands, it is recognized that the majority of the intellectual electorate, who rule by quality and not by quantity, have ratified the change. But even long before the new position has been accepted as orthodox science and the old position abandoned, fresh theories are being propounded, fresh data is being gathered by the tireless energy of the searchers into nature's secrets. Nor can we speak of the acceptance of a theory as though the vast body of scientists were a unit which speaks with one voice. Fortunately scientists are not automata, and there are very considerable and healthy differences of opinion upon the most fundamental propositions. So that at no time can it be asserted that any theory is held by all the votaries of the many branches of science. Since science rejoices in the absence of a creed, there must always be a large margin left for those who do not agree with a statement of scientific conclusion, especially since science is continually advancing. On one hand we have those who have not yet reached the conclusions accepted by the vast body of students. On the other hand, there are always those advanced intellects who, leaving behind them settled conclusions from verified facts, are already advancing through new experimental research, to more profound statements, to wider generalizations of nature's laws. The tendency of the trend of scientific thought is therefore always a more profitable object of study than the consideration merely of accepted theories, and that study finds its most fruitful field in the declarations and the propositions of recognized leaders in scientific circles.

If we can by this means discover some common point

towards which the streams of investigation converge, we may with some confidence anticipate that that point of convergence will ere long be recognized by an ever increasing number as one of the accepted theories of modern science.

The value of such a looking into the future is self-evident. As I will attempt to show later, this generalization from experience has led to the discovery of most important facts, which otherwise might have long remained in the terra incognita of science.

It is true that in thus anticipating the conclusions of orthodox science one runs counter to that large school of physicists who would banish logic from the realm of physics, and who through some peculiar view of things regard a deduction as an enemy of science; as though the creation of man's high function (reason) was a sheer waste of material by our good mother nature. Now while every one must recognize the folly of endeavoring to bend facts so that they will support preconceived opinions, it ought not to be forgotten that a refusal to recognize possible explanations is no less foolish. The "sixth sense" (reason) is surely of equal value, to say the least, with any of the other five upon whose evidence science is wont to rely.

In this essay an attempt will be made to collect and collate some of the facts recently verified by modern investigators and the conclusions to which we are necessarily led thereby.

In order to discern not only the new tone but also the radical departure which has taken and is taking place, it is necessary to recall to our minds the position formerly taken. The army of science in order to record the length of its march, must recall its old bivouac. At a time so recent that it is within the memory of all, the man of science had arrived at the conclusion that there were two basic elements in the universe, and all phenomena were thought to be referable to their interaction. These two were Matter and Motion. With few exceptions all physicists united in regarding the ultimate constituents of matter as absolutely indivisible, inert, inelastic, dead atoms.

Motion was by many regarded as a characteristic of the matter, while others, naming it force, thought it to be an independent, substantial entity, which is not a property of matter, otherwise than by its power to act upon it. Force, according to this school, resides not in the atoms, but in the space between them. This force was pictured as blind. Neither life nor intelligence was attributed to it. These latter were deemed to have been evolved in some unknown and undiscoverable operation of this blind force upon dead matter. No attempt was made to formulate any explanation which would account for the bringing into existence of life and mentality, nor was it thought that the existence of life involved the co-existence of intelligence. Intelligence was a later product. The order of things in point of time was first matter and motion (or force); next life, and lastly intelligence. As to force, investigation had not yet shown any connection between its various forms, and each was looked upon as a separate entity not necessarily bearing any relation to the other forces. There was no apparent link between light and sound; heat and magnetism were total strangers to each other. Such were, briefly, the views formerly accepted by the leaders of scientific thought.

A most radical, though gradual, change has taken place. The following pages will attempt to show, by extracts from the utterances and writings of acknowledged leaders of present-day science, that a new school of thought is now growing up whose ideas, when definitely formulated, will be found to be at an almost entire variance with that which formerly obtained. This new school finds, as a result of its investigations and conclusions, that the hard, indivisible, inelastic, ultimate particle of matter must at last give way to and is resolved into a center of force operating in a relatively homogeneous substance; instead of inertia, continual change with an inherent process of transformation is observed. It has been discovered that there is but one force and that its various forms are linked together by the infinite rates of vibration, those rates expressing themselves in harmony with the grade of the me-

dium of matter through which they are sensed. Consciousness has been found to be a third factor equally fundamental with matter and force. So that instead of the former duality we now have the trinity of science, while life must apparently be considered as an inseparable concomitant of the three.

The evidences of the existence of life and consciousness have been traced gradually backward through the lower forms of the vegetable kingdom, where has been found the presence of vitality possessing selective capacity, into the so-called inorganic world of the mineral kingdom, even to the very elements themselves where similar selective and directive power has been discovered.

The theory of dead matter and blind force has been displaced by the recognition of ever-present life and infinite grades of consciousness. Equally important has been the gradually strengthening conviction that these various factors in nature's problems are not isolated, each standing alone, unrelated to the others, but that each may rather be considered as simply an aspect of one great reality of which empirical scientific research can reveal nothing save as it is manifested through its trinity of aspects.

The Value of Theorization.

Before taking up the consideration of the main question it may be well to attempt to realize the value of the working hypothesis which our scientific friends utilize to the full, and incidentally the merits of all theorization, for all through our process of learning we find that the verified facts of one individual, must be to another, until he has developed the power to also verify them, mere hypotheses, to be worked upon to just the extent that they seem reasonable and in proportion to the confidence which he has in the one who proclaims them. The working hypotheses of one generation and one stage of evolution, are the verified facts of a later generation and of a more advanced mental perception. The mathematical rules

which the schoolboy used because of his confidence in his teacher, or his fear of the rod, are to him at first mere hypotheses, but to his teacher they are, as they may be to him subsequently, the most certain of facts. We progress in the larger school of life—in the academy of nature—in much the same way; by working out and verifying nature's rules, discovered and declared to us by those more advanced than we. In the one case, as in the other, rapid progress is accomplished only by working upon the rules thus laid down until we have by our own experience demonstrated that the rule is true or discovered wherein it is false. Facts having been collected by slow and tedious processes where the "sublime patience of the scientist" has been exhibited, it becomes necessary to relate those facts to each other, to find the underlying laws which unite them, and by thus finding the law, making possible predictions as to its future operations. In this endeavor to find their co-relation, the value of the working hypothesis is shown, and its use invoked. The mind leaps, as it were, from the isolated facts to the law which binds them. An explanation is invented. If it fits all the facts, it is, temporarily at least, accepted. It remains good until one of two things happens, either new facts are discovered which are inconsistent with the explanation or some more simple and therefore more reasonable solution is found. If the former occurs, then the inventive faculty of the human mind is again called into requisition, modifications of the hypothesis are made or possibly an entirely new light dawns upon the investigator and a clearer approach to the truth is made. But all progress is heralded by the exercise of the power of theorization.

What is a theory? It is a more or less intelligible and rational explanation of things. It serves to relate cause and effect. Every explanation is a theory. Every accounting for things is a theory. The power to theorize is one of those powers the possession of which in a marked degree distinguishes the human being from the animal, the civilized from the savage, the wise and learned from the ignorant and foolish. Instead of being a term of re-

proach, the power to theorize, in other words, reason and explain, is an indication of the highest mental development. In the words of Herbert Spencer, "In the formation of a theory we have the highest condition of the human mind." The ignorant savage is able to theorize to but a limited extent. He has not foresight or prudence. He cannot look forward into the future; he lives but from hand to mouth. As we advance in mental strength we theorize more and more as the mental vigor grows. The more highly developed the man the stronger his power of theorization. Holder, in his life of Charles Darwin, says: "Why was Darwin so much greater than others? For one thing—because he had the genius of scientific hypothesis."

The speculations of the man of science are usually an argument *in petto,* in which the law of analogy is the major premiss, observed facts the minor, and the proposed theory is the deduction. The existence of a theory, when true, often serves to bring about the discovery of new facts, for instance, the discovery of the fifth satellite of Jupiter is said to have taken place as the result of the theorizing of one of our best known Toronto amateur astronomers (Mr. A. Elvins). When the great red spot on Jupiter was noticed by the astronomers in 1878, Mr. Elvins suggested that the planet was ejecting matter which would become a satellite. Thirteen years later, reasoning from the data which was accessible to him, he came to the conclusion that the matter composing the spot was in reality a new satellite. He called the attention of Prof. Barnard to his opinion, and in 1892 Prof. Barnard, by observation confirmed the theory. To Mr. Elvin's intuitive perception and reasoning belongs a very large share of the honor of the discovery.

Another instance of the verification of a theory by a subsequently established fact is found in the discovery by Leverrier and Galle, in 1846, of the planet Neptune. Speaking of this, Prof. Ludwig Buchner, in Appleton's Popular Scientific Monthly, February, 1898, reviewing scientific progress in the closing century, says: "This dis-

covery must be regarded as one of the greatest triumphs of astronomical science, since it was the fruit of a demonstration by mathematical calculations of the existence of a heavenly body, while the actual finding and identification of it were achieved afterwards by means of the telescope."

Tyndall in his address delivered before the British Association at Liverpool in 1870, (which can be found in "Fragments of Science") makes an eloquent plea for the exercise of this high faculty of the human soul. He says: "There are tories even in science who regard imagination as a faculty to be feared and avoided rather than employed; bounded and conditioned by co-operant reason, imagination becomes the mightiest instrument of the human mind. In fact without this power, our knowledge of nature would be a mere tabulation of coexistence and sequences. We would still believe in the succession of day and night, of summer and winter, but the soul of force would be dislodged from our universe; causal relations would disappear, and with them that science which is now binding the facts of nature to an organic whole."

Imagination may be regarded as the faculty or power possessed by the personal consciousness to draw upon the larger fund of experience and knowledge possessed by the immortal ego, and, through that immortal ego, to come in contact to some extent with the universal consciousness of which it is a facet and expression. The picture evoked by the imagination is, as the word itself implies, an image, often very imperfect and very much distorted, but still a partially successful attempt to reflect and reproduce in the physical brain consciousness a picture of the great realities, the fundamental facts and laws of nature which have their basis and lie hidden in the world beyond. Prof. Tyndall intuitively sensed this fountain of imagination for he used these inspired words: "There is in the human intellect a power of expansion—I might almost call it a power of creation—which is brought into play by the simple brooding upon facts. The legend of the spirit

brooding over Chaos may have originated in the knowledge of this power."

The Trinity in Unity of Science.

We have spoken of the two great aspects of nature upon which orthodox science built all observable phenomena, that is Matter or Substance, and Motion or Force, for these pairs of terms have been used convertibly.

Thomas Huxley was, I believe, the first of modern scientists of acknowledged standing, to come to the conclusion that a third factor of equal antiquity, as essentially basic as the two already recognized, must be introduced. This third element he recognized as Consciousness.

In order to get a bird's-eye view of the great change which has taken place in scientific conclusions, the most convenient method will be to take each of the three factors separately and note the change of attitude in reference to it; and finally consider what conclusions should be drawn from the facts recently discovered. That the change of attitude is an advance may I think fairly be assumed from the fact that the view in regard to each of the three aspects of things has broadened until each is seen to overlap to some extent the other. This indicates a nearer approach to the very basis of things. Philosophically all nature must in the ultimate be recognized as one. As a matter of fact the scientist—more especially the philosophic scientist—does so regard it. And if this unity be a fact, then we may expect that the advance in scientific knowledge will be accomplished by a clearer and deeper recognition of this fundamental Unity.

Force.

Of those three aspects let us then first consider force and see what changes have taken place as a result of recent experiments.

We formerly spoke of magnetism, electricity, heat, light, sound and nervous energy, as though they were distinct entities, bearing no relation to each other.

Sir William Grove (in the Preface to his essay upon the "Correlation of Physical Forces") says that at the time his essay was written (1842), so far as he was aware, "The theory that the so-called imponderables are affections of ordinary matter, that they are resolvable into motion, that they are to be regarded in their action on matter as forces, and not as specific entities, and that they are capable of mutual reaction, thence alternately acting as cause and effect, had not at that time been publicly advanced." Observation and experiment have shown, however, that each of these forms of energy may be changed into the other. One form of this transmutation is indicated by Doctor Edward L. Youmans in his introduction to "The Correlation and Conservation of Forces." "The star-suns of the remotest galaxies dart their radiation across the universe; and, although the distances are so profound that hundreds of centuries may have been required to traverse them, the impulses of force enter the eye, and, impressing an atomic change upon the nerve, give origin to the sense of sight. Star and nerve-tissue are parts of the same system; stellar and nervous forces are correlated. Nay, more; sensation awakens thought and kindles emotion, so that this wondrous dynamic chain binds into living unity the realms of matter and mind through measureless amplitudes of space and time."

The above extract pictures the conversion of external physical forces into emotion and thought. The inverse operation also takes place, and thought and emotion are changed into various forms of physical force. That form of universal energy which, operating in our nervous organism, we term nerve force, possesses also the power of emitting light. Common examples are found in the lightning bug and in other insects and fishes. The electric eel is one instance of nerve force assuming the form of electricity, and other fishes and animals have the power of giving distinct electric shocks.

Mr. Howard Swan, in the "Electrical Engineer," reports some experiments and discoveries showing the es-

sential unity of several forms of force. After a long course of experiments, Mr. Swan has found that a certain faint, slow-moving phosphorescence, (phosphorescence being simply light without sensible heat) to be observed with suitable precautions in a dark room, within the eyeball or optic nerve (hitherto thought to be due to the circulation of the blood) is sensitive to sound vibrations, being thrown into various movements, which are subject to laws, some of which he has determined by experiment. Musical sounds produce the strongest effect. When the sound is a definite word, a tendency can be noticed in this nerve-light to form patterns more or less geometric. It is also more brilliant at times. Mr. Swan thinks that the variation of apparent luminosity and speed of movement may possibly be subjected to mathematical treatment. The fact that the patterns are to some extent under control of the will by the choice of words and sounds, gives a suggested inter-relationship of what has been regarded usually as mechanical forces with the mental activity of thought.

The conclusion to be drawn from this observation being, that mental action—thoughts—moves and moulds at the same time, the organs of speech and sight, and that this one high quality of force (the mental) expresses itself at one and the same time, as physical form, electricity and nerve action, sound and light.

Tesla makes mention of the same fact. In his lecture before the Franklin Institute, Philadelphia, February, 1893, (see "Nikola Tesla, His Inventions," etc., page 295) he said: "It now does not seem improbable that, when by the power of thought an image is evoked, a distinct reflex action, no matter how weak, is exerted upon certain ends of the visual nerves, and therefore upon the retina. * * * Helmholtz has shown that the fundi of the eye are themselves luminous, and he was able to see in total darkness the movement of his arm by the light of his own eyes. * * It is fluorescence of brain action, as it were. * * At times, when a sudden idea or visage presents itself to the intel-

lect, there is a distinct and sometimes painful sensation of luminosity produced in the eye, observable even in broad daylight."

Along the same line are the experiments conducted by Mrs. Watts-Hughes and Dr. H. Holbrook Curtis, demonstrating that sound has both form and color.

Dr. Curtis in "The Scientific American,"May 29, 1897, describes the simple mechanism of the instrument which is required to transmute the sound of the human voice into the melody of geometric form—the instrument being a disk covered with a membrane, a small drum-head in fact. After giving the description he informs us that when treated properly the membrane of this instrument is far more sensitive to the exact pitch than the human ear. It may produce one-half, one-quarter and lower fractional tones. For a given instrument the figures are exactly the same for a given tone, but the figures vary with the tension of the membrane and the size of the disk. The quality of the voice which produces the sound is also recorded. The more beautiful the voice and the more perfectly employed with respect to overtone production or harmonic richness, the more delicate and beautiful will be the picture. The picture is as exact as the tuning-fork in determining pitch. Thus is obtained a geometric musical scale. Some of our familiar airs are said to produce most beautiful pictures when thus thrown on this form-producing instrument. For instance, "Home, Sweet Home" is said to produce a perfect picture of ferns and mosses and all the luxuriance of submarine vegetation—a melody of form accompanying the melody of sound. Not only has each tone its characteristic form, but it has also its own peculiar shade of color which many musicians are able to see, and recently an instrument has been invented which, when a note is struck, throws upon a canvass the form and color, so that the color, form and melody are all produced at the same time.

Sir William Grove defines "Correlation" as "A necessary reciprocal production; in other words, that any force

capable of producing another may, in its turn, be produced by it." ("Correlation of Physical Forces"). We see how aptly this fact has been illustrated by the experiments above noticed. A wider range of this law than Mr. Grove enumerated has been found. Not only does physical force become transformed into thought, but thought transforms itself into forms of physical force. The realms of matter and mind are correlated. Stellar forms are transmuted into thought. Correlatively, thought passes out into the physical world and is there registered as physical force. Transposing Doctor Youmans' words, "This wondrous dynamic chain of correlation binds into living unity the realms of mind and matter, thought kindles emotion, impresses an atomic change upon the nerve, becomes an impulse of force which, traveling outward, though it may require myriads of millenniums to compass its flight, will exert its influence upon the remotest star which swings in the profound depths of space."

We are enabled to partially trace the path of force as it travels from low to high through varying grades of matter. Both the atmosphere and the ether are now included under the designation matter.

We all know that solid can be converted to liquid, and liquid to gas by the application of heat. The effect of this rise of temperature being increased activity of the particles of matter in the body. The space, which separates the molecules even in the most solid body, is enlarged, and the molecules have freer play, and become more intensely active. In other words, the change from the denser to more rarefied forms of matter is always accompanied by an increase of the rate of vibration of the force which manifests through the form. The higher the temperature of the heat applied the more rarefied is the form of substance. It is found, however, that a low grade of electrical energy will accomplish the dissociation of the chemical atom (the highest grade of matter known to chemists) just as effectively as an extremely high grade of heat—thus linking the action of the two.

A Scale of Vibrations.

Omitting the solid and liquid forms of matter with which we are familiar, let us watch the operation of force in the higher forms of air and ether.

On the average, sound travels through the air at the rate of 1140 feet per second. Sixteen beats per second means that a wave length is one-sixteenth of 1140 feet (about 71 feet). The lowest sound the human ear can hear is said to be one caused by a wave length not longer than about 71 feet, sixteen of which beat upon the drum of the ear within a second of time. The shorter the wave length, the more beats or vibrations there will be in a second and the higher the tone will become. For instance, starting at the sixteen vibrations per second—the lowest audible sound—and gradually increasing the rate of vibration so that the wave lengths are shorter and therefore strike the ear more rapidly, we run up through the scale of sounds until we arrive at the conversational tone of the average male voice at 128 per second. From 256 to 512 is the range of the woman's conversational voice. We thus run up through the scale of sounds until at a rate variously estimated at from 36,000 to 50,000 per second the highest sound the human ear can detect has been reached and so far as our physical organ of hearing can discern, we pass on into eternal silence. All this has been occasioned by the operation of an increasing rate of vibration of force in the substance known as air. But that is not the limit of the rate of vibration. Force continues to increase in its intensity as it passes from air to the form of substance known as ether.

The comparatively coarse air is too gross to serve as the medium for the higher rates of vibration, and the more refined and sensitive ether becomes necessarily the vehicle of expression. We are told that force expresses itself as electricity between about the limit of sound and the rate of nearly thirty-four and one-half billions of vibrations. From thirty-five billions to thirty-five trillions, we are informed, is as an unknown region of vibrations which our

senses have not yet been able to detect, measure and identify. At thirty-five trillions of vibrations per second force appears to us in the form of heat. From the lowest degree of heat to the highest each step is marked and caused by an increasingly high rate of vibration in which the sense of touch is affected—as, lower in the scale, the sense of hearing was reached. At about four hundred trillions of vibrations per second we get the first faint low tinge of red. Our sense of sight is now being appealed to. Increasing the rate we are now carried on through higher and higher colors until at about seven hundred and fifty trillions per second of vibration of force in ether the highest violet color is reached and passed. Yet we know there are higher colors than those noted. Our photographic camera has caught the ultra violet or actinic rays even where our physical eye was too dull to penetrate, and the spectroscope reveals rays of light vibrations as high as one thousand eight hundred and seventy-five trillions per second. Recently the Roentgen ray was discovered with its immense rate of hundreds of quadrillions of vibrations per second, and with a wave length which Dr. Fromm estimates to be only one-seventy-fifth of that which is found in the highest violet color. All this points to the probability that there is no limit to the rates of vibration, that our senses cover only the small arc of an infinite circle, that there are octaves of vibrations stretching out in never-ending succession of transcending harmonies and most beautiful sights. One force with infinite rates of vibration, operating in one substance with its infinite grades of density. Sir William Grove, when he refers the causation of all the forms of force to one omnipresent influence, is but voicing the opinion of other scientists.

Thus we see how that force is regarded as fundamentally a unit, though presenting itself as heat, light, nerve fluid, etc., as it operates with greater or lesser intensity, through different physical mechanism; it being possible to change one form or subdivision of force into other forms, sound into color and form, nerve force into light; thought being a link in this endless chain of vibrating force. The

whole range of phenomena is due to a difference in the rate of vibration, which difference of rate is accompanied by a corresponding variation in the density of the form of matter through which it manifests.

Matter--Unity of Structure.

Turning now to the second great aspect, Matter, we find that here also a great change has taken place and great progress been made.

We formerly heard much about the seventy-three elements and the four kingdoms—the mineral, vegetable, animal and human.

There was a very strong idea that in the seventy-three elements we had arrived at as near the beginning of material existence as it was possible to reach. And each of the four kingdoms was deemed a separate domain of nature, and until recently the great majority of naturalists believed that species were immutable productions and had been separately created. Darwin's genius cleared the way (though to Lamarck probably belongs the honor of being the pioneer of our age) to the recognition that the human and the brute were more closely related than was theretofore thought to be the case. "The Origin of Species" was written, as Mr. Darwin himself informs us, with the two distinct objects of (1) showing that species had not been separately created and (2) of showing that natural selection had been the chief agent of change. The whole of this vast collection of facts and of deductions based thereon is an argument—primarily directed to demonstrating Unity of Type in the vertebrates—(by vertebrates is meant all animals having a jointed spinal column). At page 183 of the above mentioned work, we find him saying, "According to this view it may be inferred that all vertebrate animals with true lungs have descended by ordinary generation from an ancient and unknown prototype, which was provided with a floating apparatus or swim-bladder," and he proceeds to cite instances of the conversion of an organ from one function to another. He subsequently informs us that "It is generally admitted that all organic beings

have been formed on two great laws—Unity of Type and the Conditions of Existence. By unity of type is meant that fundamental agreement in structure which we see in organic beings of the same class, and which is quite independent of their habits of life." His theory explains that unity of type by unity of descent. Mr. Darwin's whole theory of evolution rests upon the basis of the existence of some one common prototypal form having within itself the capacity of the infinite variations of structure which exist in the forms which have been derived therefrom.

But Mr. Darwin's genius for scientific hypothesis carried him much further than the unity of species, and from the facts which he had collected he was led to the conclusion that not only had all animals a common origin, but he adds, "Analogy would lead us one step further, namely, to the belief that all animals and plants are descended from some one prototype. But analogy may be a deceitful guide. Nevertheless all living things have much in common—in their chemical composition, their cellular structure, their laws of growth, and their liability to injurious influences. We see this even in so trifling a fact as that the same poison often similarly affects plants and animals; or that the poison secreted by the gall-fly produces monstrous growths on the wild rose or oak tree. With all organic beings, sexual reproduction seems to be essentially similar. With all, as far as is at present known, the germinal vesicle is the same; so that all organisms start from a common origin. If we look even to the two main divisions—namely, to the animal and vegetable kingdoms—certain low forms are so far intermediate in character that naturalists have disputed to which kingdom they should be referred, and, as Prof. Asa Gray has remarked, 'The spores and other reproductive bodies of many of the lower algae may claim to have first a characteristically animal, and then an unequivocally vegetable existence.' Therefore on the principle of natural selection with divergence of character, it does not seem incredible that, from some such low and intermediate form, both animals and plants may have been developed; and, if we

admit this, we must likewise admit that all organic beings which have ever lived on this earth may be descended from some one primordial form. But this inference is chiefly grounded on analogy, and it is immaterial whether or not it be accepted." (Origin of Species 5th Edition p. 432.)

The Protoplasmic State.

(or the Ebb and Flow of Intelligence).

Prof. Huxley in his paper on "Evolution in Biology" (Science and Culture," page 299), referring to the latter part of the seventeenth and the first half of the eighteenth century, says: "In the then state of knowledge it appeared that all the species of animals and plants could be arranged in one series, in such a manner that, by insensible gradations, the mineral passed into the plant, the plant into the polype, the polype into the worm, and so on, through gradually higher forms of life, to man at the summit of the animated world."

But this statement of the facts apparently took no note of the ebb and flow of life; of the tendency, which is so marked as to seem to be a universal law; of living matter to return to its centre and source when it has exhausted the possibilities of the form in which it was temporarily enshrined; to re-emerge in some higher form of expression, from which the ensouling life again returns to its basic form when its temporary clothing is again worn out.

It seems now to be accepted by scientists that a return to the protoplasmic condition takes place after each manifestation of matter in organic structure. It follows therefore that there must be this common base upon which all living forms rest, and through which they are connected. The matter which has manifested in gross physical structure apparently carries with it, upon its return to the protoplasmic state, some controlling tendency which inheres in it and causes it upon its re-emergence on the plane of form to be clothed in a physical structure similar to, though higher than, that in which it had previously appeared.

This swing of consciousness from structure to function and from function to structure, was not indicated in the earlier scientific proposition. "But," Prof. Huxley proceeds to inform us, "as knowledge advanced this conception" (of direct ascent) "ceased to be tenable in the crude form in which it was first put forward. Taking into account existing animals and plants alone, it became obvious that they fell into groups which were more or less sharply separated from one another; and moreover, that even the species of a genus can hardly ever be arranged in linear series." How, then, can their relation to each other be symbolized? The Professor answers, "Their natural resemblances and differences are only to be expressed by disposing them as if they were branches springing from a common hypothetical centre." The effect of these conclusions has been, as Mr. Huxley points out, rather to substitute a new metaphor for the old than to abolish the conception expressed by it. "Instead of regarding living things as capable of arrangement in one series like the steps of a ladder, the result of modern investigation compels us to dispose them as if they were the twigs and branches of a tree. The ends of the twigs represent individuals, the smallest groups of twigs species, larger groups genera, and so on until we arrive at the source of all these ramifications of the main branch, which is represented by a common plan of structure, and, when the lowest forms of each are considered, even the animal and vegetable kingdoms cease to have a definite frontier." It therefore becomes necessary to introduce a more comprehensive figure, which Mr. Huxley accordingly does. "If it is permissible to speak of the relation of living forms to one another metaphorically, the similitude chosen must undoubtedly be that of a common root, wherein two main trunks, one representing the vegetable and one the animal world, spring; and, each dividing into a few main branches, these subdivide into multitudes of branchlets and these into smaller groups of twigs."

In the opinion of Mr. Huxley the unity of structure has been proven. "Morphology," (the science of the study of

forms) he says, "exhibits a continual advance towards the demonstration of a fundamental unity among the seeming diversities of living structures. And this demonstration has been completed by the final establishment of the cell theory, which involves the admission of a primitive conformity, not only of all the elementary structures in animals and plants respectively, but of those in the one with those in the other." This common parentage of all forms, it is evident to Mr. Huxley, lies at the very root of the doctrine of evolution, and, according to him, "No *a priori* difficulty can be said to stand in the way of evolution, when it can be shown that all animals and all plants proceed by modes of development, which are similar in principle, from a fundamental protoplasmic material."

Only recently (July 20, 1899) our daily press contained a report of an interesting confirmation of the statement that there is a structural unity between the tissues of the human flesh and vegetable fibre. From Paris came interesting details of Dr. Bra's recent cancer researches. Dr. Bra found parasites similar to that of the cancer in fragments of diseased wood, particularly apple wood. He obtained the government's permission to inoculate forest trees at Meudon with cultures of human cancer, and six months later he found spots of dry rot in these trees. The trees were principally beeches, maples and sycamore. One elm tree died of cancer so communicated to it.

Prof. Wm. Crookes, in his lecture on the "Genesis of the Elements," dwells upon the fact of this unity. He explains that protyle "is a word analogous to protoplasm, to express the idea of the original primal matter existing before the evolution of the chemical elements." He declares that before the first element came into existence "matter, as we know it, was not. It is equally impossible to conceive of matter without energy, as energy without matter; from one point of view both are convertible terms." And he closes his address in these luminous words, "Summing up all the considerations, we cannot indeed, venture to assert positively that our so-called elements have been evolved from one primordial matter; but

we may contend that the balance of the evidence, I think, fairly weighs in favor of this speculation." And again Prof. Crookes tells his audience: "If I venture to say that our commonly received elements are not simple and primordial, that they have not arisen by chance or have not been created in a desultory and mechanical manner, but have been evolved from simpler matters—or perhaps indeed from one sole kind of matter—I do but give formal utterance to an idea which has been, so to speak, for some time 'in the air' of science. Chemists, physicists, philosophers of the highest merit, declare explicitly their belief that the seventy (or thereabouts) elements of our text-books are not the pillars of Hercules which we must never hope to pass."

Nikola Tesla, the electrician, is firmly convinced (see page 149 of Nikola Tesla, His Inventions, etc.) that "of all the views of nature, the one which assumes one matter and one force, and a perfect uniformity throughout, is the most scientific and the most liable to be true."

Thus we see that most eminent scientists have arrived at the conclusion that two out of the three factors in the composition of the universe are each in themselves a unity, producing the varied phenomena by the varied degrees of vibration of the one operating upon the equally varied degrees of density of the other; and, not only are each of these things thought to be one at the basis, but scientific and philosophic speculation alike declare that the two are inseparable; that in fact, force and substance are simply two aspects or characteristics of some uncomprehended fact or cause which stands back of them.

Transmutation of Forms of Matter.

But if the unity of substance be a fact, then there is a possibility of transmuting one form of matter into another. That this is within the bounds of probability is now demonstrated apparently to the satisfaction of leading scientists. As a result of the experiments made by Prof. J. J. Thompson of Cambridge, England, we have the editor of the Electrical World and Engineer saying:

"It had until recently been supposed that matter could not be divided more finely than into molecules, and that these were chemically divisible into atoms. But the atom was the end of all dissection, while an atom of iron was absolutely and completely distinct from an atom of some other substance, such as lead. Now it would seem that we can tear off minute chips from atoms, and that the chips so torn off lose identity and cannot be distinguished from one another. Of course, the suggestion naturally follows, as a matter of speculation, that if we could tear off a sufficient number of chips from the atoms of any substance, it might be possible to rearrange or reconstruct the chips in a new way, and possibly produce an atom of a different substance; or, in other words, that the process of tearing chips away from atoms is analysis of matter into 'protyle,' or the mother substance from which all chemical elementary substances may have been originally constructed."—From Literary Digest, April 14, 1900.

To show there is a common bond of unity between even the different kingdoms of nature, the mineral, vegetable and animal—some primal atomic or common condition, some homogeneous substance in nature, some elemental essence, from the aggregations and combinations of which all forms are built up—we have the evidence furnished by the processes of digestion and assimilation in man himself. The vegetable is by the physiological action of the human body changed into flesh or other animal state. The vegetable kingdom not only has the power to assimilate earth (mineral) and change it from mineral to vegetable, but the vegetable is in turn digested and assimilated by the animal and thus carried into an entirely different kingdom of nature. The dream of the alchemist of the transmutation of metals is mere child's play compared with the processes of nature occurring every day in the human body. This capability of being changed from one form to another must rest upon the fact that all forms of matter have as their basis one common element—their conception of which is by our scientific friends variously denominated "primordial matter," "protoplasm," "homo-

geneous substance," "protyle," each of these terms being intended to designate the *first* form of matter. In order to change from one kingdom of matter to another it is necessary for the object to be resolved to this primal condition, by the disintegration of its present and all intermediate forms. Thus reduced, it is ready to be operated upon by other intelligences, which mold it into the desired new form of matter.

The One Life.

The same facts which have led investigators to these conclusions in reference to force and substance have also led others to the recognition of the probability that there is a Common Reservoir of Life which stands back of its myriad manifestations upon the physical plane; a great ocean of vitality which each organized being absorbs and gives out as we inhale and exhale the air we breathe. That each being is thus affecting and being affected by the remainder of the universe. This serves as another link which binds the universe into one organic whole.

The Living Atom.

We have spoken of the definition of the atom formerly given us by the physicists "the hard, inelastic, indivisible, inert, dead, ultimate subdivision of matter." Each necessarily separate, distinct, discontinuous, clearly defined from the other.

This hypothetical atom was dead, so we were told. No wonder that Spencer declared that between such matter as that, and mind, there existed a chasm which it was impossible to bridge. Imagination could not picture any conceivable process by which unconscious force applied to dead matter could give as a product, thought, consciousness, intelligence, and Mr. Spencer gave up the attempt in despair. The electrician, dealing with a higher grade of matter found the old idea of matter as inert, dead, and inelastic would not fit in with the facts which came within his range of observation. A new definition has gradually grown up. It is now said that an atom is an electrical

centre of force and motion. No longer inert, it is believed to be pulsating with force itself. The dividing line between force and matter disappears. The two are found to be linked indissolubly together. Pointing out that the unprejudiced study of physical philosophy provides us with analogies which lead us almost directly to the opinion of the existence of immaterial substances, and enumerating solids, liquids, gases, electricity and magnetism, universal ether and gravitation, the celebrated Dr. Thomas Young says: "And of these different orders of beings, the more refined and immaterial appear to pervade freely the grosser. It seems therefore natural to believe that the analogy may be continued still further, until it rises into existences absolutely immaterial and spiritual * * * others pervade each other unseen and unknown, in the same space."

In view of this infinite gradation of matter and its interconvertibility between less and more inert forms, it is not surprising to find that many physicists deem life to be co-eternal with matter.

According to the hypothesis of natural evolution adopted by Prof. Tyndall (Fragments of Science, American Edition 1872, p. 156) "Life was present potentially in matter when in the nebulous form, and was unfolded from it by the way of natural development." As Prof Tyndall therein points out, unless it be granted that life is an inherent quality of matter in its undifferentiated, inorganic (so-called) condition, then we must accept the only other alternative, namely, that "it is a principle inserted into the matter at a later date." Scientific research all leads away from rather than towards this latter conclusion. The idea of inherent powers and qualities, gradually unfolding under the operation of natural laws, rather than a supernatural, extra-cosmic volition introducing arbitrarily new forces, is the firm rooted conviction of modern science.

The logical necessity for this eternal pre-existence of life led Prof. Huxley to declare, (page 284, Science and Culture), "and the evidence has yet to be adduced which

will satisfy any cautious reasoner that 'Omne Vivum Ex Vivo' is not as well established a law of the existing course of nature as 'Omne Vivum Ex Ovo.'"

So far as the question of life is concerned the distinction between organic and inorganic is more a matter of degree than of kind. Mr. Alfred Binet in his preface to "The Psychic Life of Micro-organisms" informs us that the teaching of general physiology "shows us that all vital phenomena are previously present in non-differentiated cells." To classify one non-differentiated cell as organic, and another as inorganic, is an arbitrary distinction which the discovery of evolution in the mineral world is gradually setting aside.

Mineral organisms hitherto deemed simple have been found to be complex; and to describe a form of matter as inorganic, is probably nothing more than a confession that the power of the instrument has reached its limit.

Wherever there is matter, there also is motion, and force is bounded and conditioned by matter. Instead of matter being dead, it is found that the mysterious thing called life is ever present in it. In fact what better definition can be found for life than that which would describe it as conscious force operating in matter, or, if we wish to describe its process, the conscious operation of force in matter?

The All-Pervading Intelligence.

Until recently, as we have seen, minerals were spoken of as inanimate and non-progressive. Evolution and consciousness were thought to apply to animal and human beings alone. The change of thought in reference to this has been remarkable in its rapidity and its scope. To speak of plants having souls; minerals having human characteristics, and selective power being found in the inorganic world, would a few years since have been thought an indication of an ill-balanced mind, or an excessively developed poetic temperament. The author of such expressions would certainly not have been regarded as an exponent of scientific observation and deduction. All that

is changed now. The inherent selective and adaptive power of all forms of matter—in other words the living consciousness of nature—is everywhere found exhibited. Professor Cope declares that, "The entire process of ascending evolution appears to be dependent on the presence of mind, i. e., consciousness in gradually more complex stages."

This is the case even in the elemental world. When the chemist takes two parts of hydrogen and brings them into contact with one part of oxygen with the result of the formation of a drop of water, can he do this entirely irrespective of the selective and formative inherent powers of hydrogen and oxygen? Surely not. Water is formed from the gases by the ordinary powers of nature without intervention at all. Is there some great "chemist-physicist" superintending nature's operations, sorting out two parts of hydrogen and one part of oxygen and mixing them together? If not, then we must believe in the inherent power of nature to produce this as well as other phenomena of nature.

But is there no intelligence exhibited when the chemist brings about this result in his laboratory? There must be somewhere an equal intelligence to produce those results in nature's laboratory. If intelligence be a factor in one case it must be a factor in the other. To produce the identical result the sum of the factors must be the same. The chemical constituents of hydrogen and oxygen, or force and substance, are the same, therefore the third factor—intelligence, selective power—must also be present.

Moreover, there is no aimless shuffling of the atoms until chance produces a fortuitous chemical combination. The union is instantaneous, self selective, and invariably responsive to the influence of affinity induced by their proximity. No hesitancy—no fumbling for a compatible alliance, but a mutual recognition of congeniality at the moment of contact, which intelligence alone could bring about. Chance with its "fortuitous concourse of atoms" will not serve to explain it. It cannot be fortuitous if similar conditions produce similar results. If it were for-

tuitous then sometimes the formula would be H2O, and sometimes HO2. Prof. Crookes, in "Elements and Meta-elements," describing certain of his experiments with the precipitation of so-called elements, instancing yttrium, says: "We cannot avoid coming to the conclusion that the action which has been going on for the past few hours is of a selective character. Out of the multitude of atoms present, what power is it that directs each atom to choose the proper path; we may picture to ourselves some directive force passing the atoms one by one in review, selecting one for precipitation and another for solution until all have been adjusted."

But the process of selection includes the exercise of the power of discrimination, and discrimination is the surest indication of the presence of intelligence or consciousness; so that this directive force, inherent in, or inseparably connected with the very smallest subdivision of the inorganic, elemental world, carries with it the most conclusive evidence that there is a consciousness within it. The sphere of its operation is very limited it is true, but within those limitations (and all consciousness of which we have knowledge works within limitations) its action is apparently more reliable than in man himself, in whom the consciousness has evolved and other qualities have been awakened which often interfere with the accuracy and wisdom of his choice.

An objection commonly made to the proposition that there is an intelligence in the elemental kingdom of nature, is the fact that in it we sometimes witness the non-beautiful, the destructive and the seemingly cruel. But the slightest consideration shows that these facts, even when true, are not inconsistent with intelligence. Intelligent man is often ungraceful, while the evidence of his destructiveness and cruelty are everywhere about us. The objectors are apparently oblivious of the absurdity of demanding that the lower kingdoms shall exhibit nobler qualities than we find in man himself. That nature produces at times in her lower kingdoms incongruities, misshapen forms, or destructive cataclysms, is no more evi-

dence of lack of consciousness than is the production by the tailor of a misfit coat, the building by a logician of a fallacious syllogism, or the destruction of his own property by a man in a fit of anger.

The Sensitive Mineral.

Mr. Roberts-Austin, C. B., F. R. S., Professor in the Royal College of Science, London, England, and chemist to the Royal Mint, lectured in Toronto in 1897, under the auspices of the British Association, then meeting there. The following extracts, taken from the Globe (August 21, 1897) report of his address, shows how little difference in kind there is between the organic and inorganic, though there may be much in degree. After showing some beautiful and interesting experiments, the Prof. said: "The experiments shown taught that metals, even when solid, were not the inert things they were supposed to be; they were really vibratory masses of great complexity. * * * * Metals are in fact sensitive things, almost sentient in their organization, strangely lifelike in their behavior. Of their genesis much might be written, and most physicists are now ready to accept, at least in principle, as the result of the life-long work of Sir Norman Lockyer, the hypothesis that the phenomena of the inorganic world are dominated by an evolution not less majestic, although much more simple, than that now universally accepted in the case of organic nature. For the main evidence on which this hypothesis rests we have hitherto turned to the spectrum analysis of the glowing atmosphere of the sun. There may be some who dread the extension of the great principle of evolution which these words imply and shrink from recognizing that the elements as we know them have, like our own species, been derived from simpler forms. * * * The metallurgist is beginning to study the molecular motion in solid metals which makes them so like living organisms."

Sir Norman Lockyer, in the following forceful words, emphasizes the fact that solid metals are in a continual state of molecular motion: "The modern physicist tells

us that the stones of which St. Paul's Cathedral is built, consist of millions upon millions of small particles called molecules; and that although St. Paul's Cathedral seems to be absolutely at rest, as if it would last forever, and although each particular stone seems equally so, yet when you get down into the intimate structure of each stone, and of every part of the fabric, you get nothing but a multitudinous ocean of motion. What appears to us solid and at rest, is absolutely in a perpetual state of unrest; in fact its stability consists in its state of unrest." (Studies in Spectrum Analysis p. 41).

But we have been informed by our scientific friends ("The Cell Theory," in Scientific Memoirs of T. H. Huxley, page 241 et seq.), that the distinction between living and non-living matter is that in the former there exists the inherent faculty of exhibiting definite cycles of change in form and composition without any external assistance, and in fact even notwithstanding external opposition, while non-living matter has the quality of inertia, and is capable of no change except that which external forces impose upon it. Of the nature of that something which constitutes the inherent power of change physiology does not assume to give us any information.

But after all is it so certain that inorganic matter possesses *no* inherent power of change? On the contrary, what means the molecular movement of the stones of St. Paul's Cathedral, mentioned by Sir Norman Lockyer, save that here is some inner hidden power which marshals and controls its innumerable host of molecules and keeps them whirling with tireless energy notwithstanding the changes of external conditions which are continually exerting themselves upon it?

The so-called inorganic world, as we have just been informed by the eminent metallurgist, Sir Roberts-Austin, is dominated by Evolution. Evolution depends upon the inherent power of the evolving entity to respond to external influences. It rests upon the supposition that that entity survives which can thus best adapt itself to its surroundings and overcome the obstacles which it meets in

the common life. This adaptability is the essential basis of all evolution, and when the chemist of the Royal Mint speaks of the mineral as a "sensitive thing," in which evolution is going on, he must justify his expression by the fact that he has discovered in that kingdom the presence of inherent powers similar in nature though lower in degree than those found at work in the higher kingdoms.

In other words, a selective power is present. The mineral is able to discriminate and choose.

Upon this point the metallurgist finds himself supported by no less eminent authority than Sir William Crookes, who, as we have seen, finds selective power present in the very elements themselves. The evolution which is taking place in the mineral kingdom is then the evolution of this selective power, a widening of the range and a strengthening of the power of discrimination. In other words—the evolution going on in the inorganic world is an evolution of intelligence, or life. The one important fact, (namely, an inherent power of change and adaptability) which served to mark the difference between living and dead matter has been found to characterize mineral as well as plant and animal.

While Prof. Roberts-Austin speaks of metals as "in fact sensitive things" and like "living organisms," Prince Kropotkin in the November (1897) number of the Nineteenth Century calls attention to the fact that of the soil (a compound of mineral and vegetable) stronger terms may be used. Dealing in that magazine with the researches of German scientists into the subject of the prevalence of bacteria among the roots of the Leguminosae, one of the great families of plants, and of their essential necessity for the growth and well being of the plants, he says: "As to the scientific value of the discoveries of Winogradsky, Hellriegel, Nobbe, and all other workers in the same field, it is self-evident; they have opened quite a new field of research, and while we were beginning to look too much upon the soil as upon an inert mineral mass, they have made us revert to the only true conception that the soil maintains life *because it is living matter itself.*" In

the words of Prof. Wiley, of the United States Department of Agriculture, "It is a living organism."

To Prof. Huxley's dictum that there are three aspects of things, what meaning can be attached save that in every form of substance force is operating, and that wherever we find substance and force, there also consciousness is present—this consciousness even in the lowest form of matter, being indicated, as we have seen, by the selective capacity.

Let us add to this the declaration of Dr. Thos. Young, "that the unprejudiced study of physical philosophy provides us with analogies which lead us almost directly to the opinion that there are gradations of substance stretching all the way from the solid material to the spiritual, the more refined and immaterial pervading freely the grosser;" and the existence of gradations of consciousness, reaching from the inert mineral to the highest manifesting God, becomes a necessary conclusion; and with that there comes the corollary that in connection with each of these grades of consciousness there are accompanying grades of substance and force—the grade of each of the three aspects being in harmony with the other.

We are thus, step by step, led to the conclusion that intelligence is present throughout all nature. In the words of William Kingdon Clifford, in his essay on "Body and Mind," "The only thing we can come to, if we accept the doctrine of evolution at all, is, that * * * (for we cannot stop at organic matter, knowing as we do that it must have arisen by continuous physical processes out of inorganic matter, we are obliged to assume, in order to save continuity in our belief, that along with every motion of matter, whether organic or inorganic, there is some fact which corresponds to the mental fact in ourselves. The mental fact in ourselves is an exceedingly complex thing; so also our brain is an exceedingly complex thing. We may assume that the quasi-mental fact which corresponds and which goes along with the motion of every particle of matter is of such inconceivable simplicity, as compared with our own mental fact, with our consciousness, as the

motion of a molecule of matter is of inconceivable simplicity when compared with the motion of our brain."

And, he proceeds to assure us: "This doctrine is not merely a speculation, but it is a result to which all the greatest minds that have studied this question in the right way have gradually been approximating for a long time."

Intelligence in Vegetable Compounds.

The molecules of vegetable matter possess, in a more marked degree than the mineral, the ability to select and combine with each other. Prof. F. R. Japp, F. R. S., who presided over the chemical section of the British Association meeting of 1898, is of the opinion that in the formation of even the lowest of the vegetable compounds there is most unmistakable evidence of the existence of intelligence. His address as president of his section was devoted to the purpose of demonstrating the reasonableness of that proposition and showing the former explanations of chance, coincidence and non-intelligent mechanism to be insufficient. He asserts the intelligence thus operating to be of precisely the same character as that which man himself uses. The following is an extract from his address: "No fortuitous concourse of atoms, even with all eternity for them to clash and combine in, could compass this feat of the formation of the first optically organic compound. Coincidence is excluded, and every purely mechanical explanation of the phenomenon must necessarily fail. I see no escape from the conclusion that at the moment when life first arose a directive force came into play—a force of precisely the same character as that which enables the intelligent operator, by the exercise of his will, to select one crystallized enantiomorph and reject its asymmetric opposite."

While the Professor draws the line at optically organic compounds of vegetable origin, and asserts that with them life first arose, his arguments lead to an altogether deeper conclusion. He combats the theory that living matter may be originated from dead matter by a purely mechan-

ical process, and intimates that the attempted mechanical explanation of the origin of life leads to a *reductio ad absurdum*. He confesses that if the conclusions are correct, which he believes to be correct, "then the *absolute origin* of the compounds of one-sided asymmetry to be found in the living world is a mystery as profound as the absolute origin of life itself." An asymmetric compound is one which is not complete and evenly balanced, and which, because of its incompleteness, seeks to ally itself with its chemical affinity and therefore continues in a condition of restless activity. He affirms that "The two phenomena" (life and these asymmetric compounds) "are intimately connected, for, as we have seen, these asymmetric compounds make their appearance with life, and are inseparable from it."

But if non-living inorganic matter, interacting with blind force through pure chance, the "fortuitous concourse of atoms," cannot produce the living compound, if "every purely mechanical explanation of the phenomenon of the production of the living compound must necessarily fail;" and if, on the other hand the phenomena of life and intelligence are inseparably connected with the phenomena of asymmetric compounds; and those compounds according to the principle of evolution, arise without the intervention of the human will and intelligence; and since the tendency of our scientific friends is to discard the idea of an arbitrary extrinsic controlling intelligence, why not calmly accept the only other legitimate alternative, namely, that it is incorrect to say that the matter of the inorganic world is non-living, or else that force, which is found operating in that realm of nature, has intelligent life as its inherent characteristic? May I venture to suggest that this would be more logical, more philosophical and even more in accordance with true science than to confess "mystery" before the necessity for so doing had inevitably arisen? No one is able to put his hand on the exact line where, in the descent from the organic to the inorganic, life ceases to operate, or even where the organic commences. "The principle of

continuity leads us, whatever state of things we contemplate, to look for its antecedent in some previous state of things also in the universe," and in accordance therewith, the antecedent of that intelligent selective power which was exhibited in the first optically organic compound is naturally to be looked for in the previous state of things which we speak of as inorganic.

If I understand him aright, Prof. Crookes thinks he finds the evidence of the operation of the intelligent selective power in the precipitation of certain elements to which we have already referred. That intelligence which Prof. Japp associates with life, and sees exhibited in the chemistry of nature as it works in the living organism, Prof. Crookes discovers operating in the so-called inanimate, inorganic world. Does this not suggest that, instead of there being an absolute difference in the qualities of the two classes of matter, the difference is in the *active manifestation* of the quality, possibly coupled with a difference in the powers of observation and deduction of the two chemists? But even Prof. Japp's discoveries and conclusions travel a long way in the direction of the recognition of the universality of intelligence, for he finds it exhibited in tartaric acid, turpentine, the carbohydrates, quinine and other like forms of matter to which intellection is not usually ascribed.

If indeed, as Prof. Japp thinks is the case, there is no escape from the conclusion that inherent selective and directive force of the same character as the human being exhibits, be coeval with life; if as Prof. Crookes thinks. there is no escape from the conclusion that this selective operation is present in the very elements themselves; and if, with Prof. Huxley, we find that "Life was present potentially in matter when in the nebulous form, and was unfolded from it by the way of natural development," have we not covered the whole range of the primitive forms of matter recognized by scientists and found in them all the evidence of an inherent consciousness? Are we not justified in concluding that, from the very beginning of existence, inherent intelligence, of precisely the same char-

acter as that which enables the intelligent operator to produce desired results, has been at work?

Charles Kingsley, in Hypatia, expresses this idea of conscious activity in the lower kingdoms poetically and at the same time in accord with the most recent science. Says he: "Philosophers, when they gave mechanical explanations of natural phenomena, came no nearer to the real solution of them. The mysterious "why?" remained untouched. * * * * All their analyses could only darken with big words the plain fact that the water hated the oil with which it refused to mix, and the lime loved the acid which it received into itself, and like a lover grew warm with the rapture of affection. Why not? What right had we to deny sensation, emotion, to them, any more than to ourselves? Was not the same universal spirit stirring in them as in us? And was it not by virtue of that spirit that we thought, and felt, and loved? Then why not they as well as we?"

Where we had ignorantly (though as we thought with much of learning and wisdom) talked of inanimate, inorganic, matter, conscious life is present working intelligently and purposively, carrying out the universal scheme of evolution, which stretches from the lowest to the highest. Consciousness, dormant in the stone, is by the interplay of nature's forces gradually wakened into activity, and, as it wakens, it clothes itself in higher forms, each new capacity awakened requiring a higher organism through which to express itself and to expand; each ascending organism more complex and more refined than the last. Slowly yet surely it winds its way, climbs its path from lowest to highest of mineral forms until it stands on the border line of two worlds, the mineral and vegetable kingdoms, where it partakes of the nature of both to such an extent that we know not in which kingdom to classify it. From these intermediate forms it steps over into the kingdom above (the vegetable) where the plasticity of the matter affords freer play to the activities of conscious force.

The Soul-Life of Plants.

The consciousness exhibited here is of a most marked character. Let us take for instance the insect-eating plants. I quote from "The Story of the Plants," by Grant Allen. "Our pretty little English Sundew is one of these cruel and perfidious plants. Its leaves are round and thickly covered with small red hairs, which are rather bulbous at the end, and very sticky. The bulbous expansions, in point of fact, are small red glands, which exude a viscous digestive liquid. When a small fly alights on the leaf, attracted by the smell of the sticky fluid, he is caught and held by its gummy mass; the hairs then at once bend over and clutch him, pouring out fresh slime at the same time, which very shortly envelopes and digests him."

Let us take another illustration of these insect-eating plants from Mr. Grant Allen's interesting work. Sadly enough the most striking exhibitions of intelligence are to be found in connection with the invention of death-dealing mechanism. The height of plant civilization is apparently on nearly the same moral altitude as that of the human being. "One of the best known is the Venus' fly-trap of tropical or subtropical North America. In this curious plant the leaf is divided into two portions, one of which forms a jointed snare for catching insects. It is hinged at the middle; and when a fly lights upon it, the two edges bend over him, and the bristles on the margin interlock firmly. As long as the insect struggles they remain tightly closed; when he ceases to move, and is quite dead, they open once more, and set their trap afresh for another insect."

Herbert Spencer, in a phrase which has become famous, defined life as "adaptation to the environment," and common sense and intelligence are perhaps most strongly exhibited in making the best of one's surrounding circumstances. Measured by this standard the intelligence of the ivy-leaved toad-flax is of a high order. This plant grows on dry walls and has straight flower stalks, which become curved when the flowering is over. Why is this? Because it cannot sow its seeds on the bare stone the

plant bends its flower-stalk after the blossoming season, and hunts about diligently for a crevice among the mortar into which it proceeds to insert its capsule, so that the seedlings may start fair in a fit and proper place for their due germination.

Notwithstanding the evidences of intelligence in the flower and stalk, the tip of the root, in its selection of just the proper location for itself in order to obtain the fullest benefit of the available water supply, and in the way in which it goes feeling its way under ground, touching here, recoiling there, insinuating little fingers among pebbles and crannies and trying its best by endless offshoots to fix the plant with perfect security, is the part of the plant which exercises the greatest discrimination and ingenuity. Darwin, because of this exhibition of intelligence, likened the tip of the root to the brain of animals.

Mr. Grant Allen, in describing the various elements which go to make up the life of plants, mentions how they eat and drink, how they digest and assimilate, how they marry and get fertilized, how they produce their fruit and set their seeds, and finally how they are often linked together into a single community. This summary bears a very striking resemblance to the range of activities exercised by the average man and woman.

In January, 1898, Mr. C. W. Dodge, Professor of Biology of the University of Rochester, N. Y., lectured before the Rochester Academy of Science on "The Psychic Activities of Plants;" that is the "soul activities of plants." A daily press report of his address says: "The speaker gave an exposition of the phenomenon of sight in plant life. Many views were thrown on the screen, of plants whose growth had been influenced by light. The sense of touch was also illustrated vividly, the peculiarities of their growth, under certain circumstances exhibited. The habits of certain plants of depositing their seeds in fertile places was one of the most remarkable proofs of a faculty which was too well known to be called chance. The existence of nervous sensations in plants was taken up, and the Professor showed that nerve stimulus was imparted

from one to the other of many organisms in plant life, but more commonly in bacteria." The nature of his conclusions may be judged from the following extract: "Plants have souls and can see and feel in their own peculiar way quite as well, as far as their needs were concerned, as many creations of a higher order."

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Thus, by new experiences through more susceptible organisms, consciousness ascends until it again finds itself enshrined in a form which unites two kingdoms, this time it is the vegetable and animal. Sensation—the power of translating the vibration received from external nature into feeling, which had began to waken in the vegetable, becomes fully developed here. A consciousness of comfort and discomfort, of pleasure and pain, marks its advent to the higher kingdom of nature. Here again scientific investigation has demonstrated the universality of the expression of life, and the striking similarity on all planes of nature of the phenomena exhibited through intelligence operating upon matter.

The Animal World.

In the inorganic world it has been noticed, as Sir Norman Lockyer points out (Studies in Spectrum Analysis p. 138), that "a compound particle—that is a particle known to consist of two distinct elements—has a vibration which is as peculiar to itself as the vibration of a particle of an element is peculiar to itself." That "a compound particle is a perfectly distinct physical thing, with vibrations, rotations, and free paths of its own. There is no apparent connection between the vibrations of a compound particle and those of any of the substances which make up that compound particle."

In the higher kingdoms we find that not only is the organic consciousness of an entirely different nature from that of either of the factors which produce it, but we discover that the lower organisms possess an independent conscious activity even while working within the more

complex and being dominated by it. Says Virchow, "What is the organism? A community of little cells, a little state, well provided with all the appurtenances of upper and under officials, servants and masters great and small."

If we consider the human body closely we find there not only the human organism itself with its will controlling the movements of the whole body and each of its members, but in addition we are told by our biologists that "every molecule of matter in the human body is a distinct life," in other words, there are millions of separate lives all working under the dominion of the one human life. We are further informed by our biologists that of the microbes with which the human body is teeming, and whose presence our medical friends are making responsible for nearly all our diseases as well as our good health, each one in the human organism "has a life consciousness of its own, with a power of independent volition (within limits), with likes and dislikes exhibited in a strange imitation of the human being himself."

Mr. Alfred Binet has written a very interesting book called the "Psychic Life of Micro-organisms" in which he says: "Agreeable to the ideas of evolution now accepted, a higher animal is nothing more than a colony of protozoans." A "protozoan" is the first, lowest, simplest and most primitive animal. It is a complete entity which may exist within a single cell of the larger animal. "Every one of the cells composing such an animal has retained its primitive properties, giving them a higher degree of perfection by division of labor and by selection. The epithelial cells that secrete the nails and the hair are organisms, perfected with reference to the secretion of productive parts, similarly, the cells of the brain are organisms that have been perfected with reference to psychical attributes." And "Those protozoic forms of animalculae are endowed with memory and volition."

A Battle in Germ-Land.

The following article, which appeared in a recent issue of a daily paper, contains a graphic description of one of the incidents of life in the domain of the animalculae. It purports to describe what was seen by Dr. Donald Ross, of the Indian medical staff, who was investigating the microbe of malaria.

"During his investigations Dr. Ross saw one of the most remarkable battles that has ever occurred. This was a fight between a malaria microbe and three phagocytes. The phagocytes are really white blood corpuscles. They have been called the policemen of the blood, and their business in life is to devour all the impurities, foreign substances and disease germs of the blood.

"The malaria germ propagates its species by segmentation (that is by simply dividing itself into two parts). Periodically every day, or every three days, or every four days, according to the type of the disease, the full grown germ subdivides, and each division becomes a full fledged microbe with power to reproduce itself. The young germ, however, is in danger of being devoured by phagocytes in the blood. In fact a great many are thus devoured.

"It has instinct enough to protect itself from further depredations of phagocytes. It feeds on the contents of red blood corpuscles, and as it devours the contents it crawls inside the 'skin' of the latter, the better to keep clear of the phagocytes. These little scavengers of the blood actually have been seen under the microscope to be 'fooled' by this trick of the malaria germ. The germ does not eat the 'skin' of the red corpuscle. Therefore when the phagocyte comes up to the malaria germ inside the red blood corpuscle it may feel it all over but it generally passes by, misled as to its genuineness. So the malaria germ, secure in its retreat, goes on eating the inside of its little house and growing lustily against the time of its reproduction.

"While observing a malaria germ which had just ac-

quired its flagellae (long hair-like appendages which serve the purpose of both arms and legs) Dr. Ross saw a phagocyte make its way to the malaria germ, probably with the intention of devouring it. Ordinarily this would have been easy, but the germ, instead of allowing itself to be attacked, attacked the phagocyte in a battle royal that lasted over fifteen minutes. Finally the phogocyte drew off and the germ, still full of fight, hurried across the microscope slide for a distance of two fields, to where another phagocyte was wandering aimlessly.

"It hurled itself on the second phagocyte, pushing hard against it with one of its arms. The phagocyte tried to rear up and get around and envelope the germ, but finally gave up and flattened itself against an air bubble, while the germ still kept on pummelling it. After fifty minutes, another phagocyte appeared coming rapidly across the field. The germ then left its fallen foe and attacked the new-comer. The third phagocyte got enough of it in about one minute, and turned squarely around, fleeing across the whole field, 'the germ hanging on like a snake on a dog.' After five minutes the germ let go and the phagocyte slunk away. The malaria germ had by this time reached the limit of its endurance in the rapidly weakening blood on the microscope slide. It grew slightly larger and quite sluggish and finally attached itself to the glass of the slide and died."

The Amoebae are microscopical organisms, a most simple elementary cell, a protoplasmic drop, formless and almost structureless. L. Cienkowsky (Betrage zur Kentness der Monaden Archiv. J Mikroshop, Anatomie) describes the way in which one of these microscopical, bare, reddish cells—the Vampyrella Spirogyra, hunts for and finds among a number of other aquatic plants one called Spirogyra, rejecting other food. Examining it under a powerful microscope, he found it, when moved by hunger, first projecting its pseudopodiae (false feet). It being so simple in its structure that it creates each organ from itself as the occasion arises, thus becoming foot or mouth or stomach at will.

Then it commences moving about until among a great variety of plants it comes across a Spirogyra, after which it proceeds towards the cellulated portion of one of the cells of the latter, and placing itself on it, bursts the tissue, sucks the contents of one cell and passes on to another, repeating the same process. This naturalist never saw it take any other food and it never touched any of the numerous plants placed by Cienkowsky in its way. Mentioning another Amoebae—the Colpadella Pugnax. He says that he found it exercising a choice of food, and he adds these significant words: "The way of acting of these monads during their search for and reception of food is so amazing that one is almost inclined to see in them *consciously* acting beings."

To this last observation we may add the words of Th. W. Engleman (Betrage zur Physiologie des Protoplasm). After reciting the efforts of the Arcella, another unicellular organism, to extricate themselves from uncomfortable positions, he says, "It is impossible not to admit that such facts as these point to the presence of some *Psychic* powers in the Protoplasm."

When we remember that the animalculae are so small that, as estimated by Ehrenburg, five hundred million of them exist in one drop of water one-twelfth of an inch in diameter, and that not only the blood, but the flesh and muscles also are composed of myriads of infinitesimal lives, each cell possessing a distinct life of its own, Binet's description of the higher animal as a colony of protozoans becomes remarkably appropriate. Each human being is veritably a Chinese Empire.

Thus we have traced conscious life from the dust out of which man is said to have been formed, up through all the intervening kingdoms of nature until we reach man himself, who possesses the intellect to plan and the will and capacity to put into operation those methods by which he controls all the kingdoms beneath him.

Conscious life present in the lowest kingdom of nature —the mineral. Conscious life everywhere in the universe varying in its degrees of expression between the fast-

bound, slow and imperviable rock and the space-defying mind of man.

Thus the process of evolution goes on. Who will venture to say where it will stop? Having passed from animal to man, when man shall have reached the limit of possibilities which intellection affords, when the organism which we now use becomes insufficient for the manifestation of more fully awakened powers, must we not, judging from the analogy from the known path of evolution we have already trod, step into some higher form of expression where our powers will not be "cribbed, cabined and confined" as they would be within the slow moving particles of the human brain? Such must be the case if from the past we may judge the future. In his essays upon "Some Controverted Questions," Prof Huxley, keeping himself within the bounds of scientific thought, suggests this ever-ascending scale of intelligent beings. He says, "Looking at the matter from the most rigidly scientific point of view, the assumption that, amidst the myriads of worlds scattered through endless space, there can be no intelligence, as much greater than man's as his is greater than a black beetle's seems to me not merely baseless, but impertinent. Without stepping beyond the analogy of that which is known, it is easy to people the cosmos with entities, in ascending scale, until we reach something practically indistinguishable from omnipotence, omnipresence, omniscience. If our intelligence can, in some matters, surely reproduce the past of thousands of years ago, and anticipate the future thousands of years hence, it is clearly within the limits of possibility that some greater intellect, even of the same order, may be able to mirror the whole of the past and the future." Ruskin (Ethics of the Dust) saw great good in this idea of the gradation of life, for he said, "it admits the idea of a life above us, in other creatures as much nobler than ours, as ours is nobler than that of the dust."

The one process of evolution links together the lowest and the highest, and in the inert atom of the mineral there lies the possibility of the man and the deity, which will

waken into realization by the steady onward press of evolutionary process.

The recent discoveries of our patient scientific investigators are showing us that not only is there life in every form of matter, co-eternally linked to it, but that the difference between the consciousness of the atom and that of the cosmos, between the intelligence of the animalculae and the intelligence of the man, is but to be measured by evolution. It may be that millions of years may be required to waken the sleeping consciousness of the mineral to its first faint response in the vegetable, and other millions to raise it from the vegetable to the animal, and from the animal to the human, and then from the human to the cosmic—which we may not inappropriately term the Divine. But no matter how long the time, nor how infinite the variations of forms that may be required to accomplish the journey it will finally be accomplished. The latent potentialities which slept in the mineral will be wakened one by one into active powers and thus higher stages of consciousness will be reached. We can, to some extent, measure the possibility of future achievements by the depths of conscious intelligence which separate us from the mineral.

Our scientists are not insensible to the importance of the new and broader view of the universe which comes as a result of this closer study of the activities of living matter. Some, conscious of the radical difference between the conception of inorganic matter as being "dead," and the view in which it is now coming to be regarded, claim that the discovery of the existence of Life in mineral is fit to be ranked with the work of Darwin. And it is reported that Prof. Shaler, of the chair of Geology at Harvard University, declares that the Unity of life is the greatest discovery of the nineteenth century.

All of the recent discoveries apparently tend to the one goal. The more thorough the investigation of the aspects of nature the more closely they are seen to approach each other. The infinite Diversity in nature was that which formerly fixed the attention of the investigator.

Its infinite Unity is the marvel which now excites his admiration. Prof. Ludwig Buchner, "Appleton's Popular Science Monthly," Feb. 1898, dealing with scientific progress in this century, mentions that "the unity and immortality of Force" have been demonstrated. Nor has science rested there. We have seen how the unity of Matter, and of Life have also been accepted. In the article just mentioned, Prof. Buchner calls our attention to the fact that "Spectrum analysis, also, in conjunction with the curious double stars has brought about the highly important conviction of the unity of what is to us the visible universe." All these conclusions of science but lead up to that more profound unity suggested by Tyndall (Scientific Use of Imagination) in the words "Supposing we had been brought to regard them" (spirit and matter) "as equally worthy and equally wonderful, to consider them in fact as two opposite faces of the self-same mystery."

In a chapter written for the purpose of showing that Religion and Science were not essentially antagonistic, Mr. Herbert Spencer (First Principles, Chapter on "The Reconciliation"), points to this great fact of unity as the common ground of the two. His words are as follows: "We are obliged to regard every phenomenon as a manifestation of *some* Power by which we are acted upon; phenomena being, so far as we can ascertain, unlimited in their diffusion, we are obliged to regard the Power as omnipresent; and criticism teaches us that this Power is wholly incomprehensible. In this consciousness of an Incomprehensible Omnipresent Power, we have just that consciousness on which religion dwells. And so we arrive at that point where Religion and Science coalesce. * * * The final outcome of their mutual criticism can be nothing else than an entire agreement on this deepest and widest of all truths."

"Man the Mirror of the Universe."

By a comparison with man himself we can perhaps best focalize and illustrate this great fact of cosmic unity, coupled with the other equally important and more readily observed fact of the presence within that unity of distinct entities, each carrying on its own evolution in its own way, yet each sharing in the common destiny.

In the human being we have various forms of conscious life, manifested at the same time, all working within and subject to the more fully developed consciousness of the man himself; mineral life with its low degree of consciousness yet carrying on its own activities within the human body; vegetable growth also controlled by its own psychic or soul life or consciousness; the animalculae, the bacilli and the microbes, waging their battles for existence within the larger organism of the human body; and over all the human mind, willing, controlling, directing, the supreme ruler of that universe which is included within the limits of his body. So in the yet larger organism which we speak of as the universe or cosmos. When once the homogeneity of substance, and the unity and universality of force, consciousness and life are apparent, we are led upward to the probability, as a direct and logical sequence of the best scientific research of our day, that here is a larger organism, dominated by a supreme intelligence, a cosmic consciousness, governed by a universal will, in a manner analogous to that by which man governs and provides the conditions for the various inferior forms of life which find their brief day within the environment which he makes for them. As man includes each atom in his body, and as his intelligence and will determine the sphere of activity and conditions under which the atom with its more limited intelligence and powers must work—*his* habits, which are the special application of the general laws of nature, constituting to a large extent *their* laws, so the entity which we speak of, either as the universe itself or as God, includes within it every human being, everything manifest and unmanifest. The intelligence of this universal entity fixes the laws of His universe in a manner

somewhat analogous to the manner by which through our habits we determine the condition and powers of atomic life within us. There are natural laws, and yet each intelligent being has the power to place himself either in harmony or disharmony with those laws; thus affecting his physical body and every atom thereof. In a similar way the universal intelligence may possibly assume one or other of many relations to still more general principles of absolute existence and by thus determining its relation to higher laws affect all its own methods of operation; in other words make the laws of its own universe. Thus considered, we would have degrees of intelligence and power extending all the way in gradually ascending stages from the atom to the Absolute, each being but one link in the endless chain of existence. The universal Deity so far transcends our powers and fixes the range of our operations that it to us presents the idea of omnipotence. This conception of the omnipotence and omniscience of the Deity is most uplifting; but the truth is made all the more valuable by the knowledge that the omnipotence and omniscience are but relative, and that away beyond this relation of things stands the Absolute Principle, so far beyond us that the eye of the keenest intellect can discern naught of the limit of its capacities, the human mind can have no comprehension of the infinite Be-ness.

The Dual Process of Nature.

Evolution is only a half truth. Within that Eternal Being which is the Cosmos there are continually going on two processes, opposing but not inconsistent. One of these is evolution. Its converse is involution. Involution is the tendency of the noumenal, the subjective—the spiritual, the essence of life and being—to rush outward or downward to the phenomenal, the objective, the material, the form in which it manifests itself. Through involution active powers tend to become latent possibilities. Through it the powers of the universe become wrapped up in the most inert and solid forms of matter. It finds its expression in the gradual densification of matter and

a corresponding lessening of the activities of conscious force (spirit).

In the process of the making of our solar system, if we start at a stage when manifestation is about to take place, the Divine Being having assumed the dual aspect of spirit-matter, motion is apparently retarded in that it passes from the active to the passive condition of energy. The consciousness which is wrapped up in the motion becomes less and less active; matter becomes less and less affected by it, until through stage after stage of descending consciousness the final limit of materialization takes place, matter has reached its most inert condition, the effect of the impulsive life within becomes the least noticeable. Yet the higher aspect of this entity has not ceased to be. In the words of Krishna, "Having pervaded this whole universe with a portion of myself, I exist" (Bhagavad Gita). The downrushing tendency of involution is everywhere met by the uprushing stream of evolution. The two great tendencies of things ever serve to preserve the divine equilibrium. The Materialist and the Idealist each alike but give expression to a half-truth. The former has his mental gaze fixed upon the process which unfolds the latent possibilities and transforms them into higher and yet higher forms of activity, and therefore sees in the physical world the source and promise of the higher; the latter, going back of things as they now are, seeks for their cause and finds the manifest proceeding from the unmanifest. The two are but complementary modes of operation of the great reality.

In this involutionary process, as we can readily perceive, down to a certain stage substance would remain homogeneous, force undivided and conscious life unified. The time came, however, when from the one the many should proceed. Innumerable centres of energy were formed in space, force whirling with inconceivable rapidity, gathering around it the primordial substance, each centre having necessarily linked with it the threefold characteristics of consciousness, force and substance. Consciousness and force being the function, they operate upon substance and thus build the structure.

This involutionary process of nature has not been so strongly emphasized by our scientific friends as has the converse fact of evolution. Their attention has been so keenly interested in the one that the other has been by many allowed to pass unnoticed. Yet not entirely. Scientists long since declared the impossibility of a creation out of nothing. *Ex nihilo nihil fit.* An eternal *transformation* is alike the dictum of science and the teaching of Theosophic writers. Yet if nothing can be created anew, all these present forms, as well as those which are yet to come must have had an eternal potential existence. This is a logical necessity which impressed itself upon the mind of the scientist and the philosopher, and accordingly we have Prof. Ludwig Buchner declaring that, "All yet future forms, including reasoning beings, potentially or in capacity—must have existed in the primal world-mist out of which the solar system was gradually evolved." The same idea of involutionary process is suggested by David Starr Jordan, President of the Leland Stanford University, in the February, 1898, number of the Popular Science Monthly, when he points out that "the recognized law of biology is that function precedes structure," that "something of mental action came before there was ever an organized brain." The conclusion—so irresistible that it has become a recognized law—forced upon investigators by the study of biology—that science which investigates the phenomena of life, we thus find to be in entire accord with the doctrine of the involutionary process in nature, taught in Theosophic literature. Mentality before an organized brain, in other words, the mind before the body; primal chaotic world-mist, with all its possibilities, before the organized physical globe; involution before evolution so far as the earth at its present stage of manifestation is concerned. And yet in the larger sense the two processes are eternally concurrent, though there is a cyclic law running through it all which gives an alternate period of dominancy first to the one process and then to the other.

The dual process of involution and evolution enters

into all growth. As an example let us look at the process of the growth of a plant. This is carried on through a gathering in of all the material of plant growth through leaves and roots from air and earth. It grows. Presently the bud develops, the seeds fill, expand and ripen. From all parts of the organism of the plant its vital forces concentrate the life principle in the seed, so that within these tiny particles all of the potentialities of future plant life are wrapped up. Within the seed lies the future stalk and root and leaves and even the future generation of seeds.

All this has by the process of plant growth been "involved" in the seed. This is Involution. When those seeds, planted, commence to germinate, and a new plant springs forth and develops we have the process of Evolution. Yet we have Evolution as well as Involution going on in the formation of the seed, for all through the process of growth there is the building of more refined and fitter structures, a more complete vitalization thrown into the seed, which in turn gives birth to a more advanced specimen. And the Growth of the plant includes not only the fact of evolution, but this growth is accomplished only through the drawing in and specializing for the use of that distinct organism, of the life forces and material from the great oceans of life and matter. This is involution. The two processes are thus seen linked together, each including and dependent upon the other. They are concurrent. Why is evolution more rapid in vegetable than in mineral—in animal than in vegetable? Is it not because, as the ascent is made in the scale of being, the vegetable lends itself to the involutionary process more rapidly than does the mineral, the animal more readily than the vegetable? Each drinks in, according to its power, the life force and material from the surrounding environment, wraps them up within its form, and by their means its own evolution is made possible.

When involution has reached its utmost limit of materiality the process of evolution begins to show its power. Potential energy is transformed into kinetic. The swing

of the pendulum of eternity carries life up the ascending arc of being. Evolution is the unfolding of powers, capacities, qualities. All the infinite possibilities of the universe are wrapped up in each molecule and atom of matter, even as all the possibilities of the plant are wrapped up in each seed. Not only is the atom a world in embryo, but its very motion is a miniature duplicate of the motion of the universe.

Nikola Tesla (page 149 of his Inventions, etc.) describing the process of producing magnetism, says: "An infinitesimal world, with the molecules and their atoms spinning and moving in orbits, in much the same manner as celestial bodies, carrying with them and probably spinning with them, ether, seems to my mind the most probable view. The spinning of the molecules and their ether sets up the ether tensions or electro-static strains, the equalization of ether tensions sets up ether motions or electric currents, and the orbital movements produce the effects of electro and permanent magnetism." If one might paraphrase the concluding sentence in the above and make it appropriate to the planetary movements, it would run as follows: "The spinning of the planets in their ethereal envelopes generates a force which attracts or repels other planets, the equalization of those tendencies of attraction and repulsion induce the great life current of the solar system, and the movements of the planets in their orbits cause those planetary conditions and changes which determine the vitality of the universe in all its parts.'

This still approaches the consideration of causes from the materialistic point of view and possibly does not recognize a supreme controlling power which determines, or at least, affects even the movement of the atom. But the illustration is helpful, for knowing these molecules and atoms to be inspired by living forces, we can see how the smaller organism may affect the larger, the interplay of the molecules producing those physical sensations which often become an important factor in determining our conduct.

Returning, however, from this digression to a consider-

ation of the effects of interatomic activity upon the possibilities wrapped up in each atom, we find that the contact of atom with atom wakes up these sleeping potentialities, and there arises the consciousness of the molecule. The cell is built from the interplay of molecular activities. More and more complex organisms spring into existence to meet the requirements of an ever-widening consciousness—an ever-brightening intelligence. The differentiation into the many provides the mechanism by which the latent consciousness in each is wakened into active powers. The contact of the external world, beating upon the wall of matter which encases the consciousness, finally induces by its continuous repetition a state of activity of the life within which our scientists in one phase of its manifestation have termed "nervous excitability;" i. e., power possessed by the within to respond to the without. The exciting cause is the vibration proceeding from the without to the within, while the inciting cause may be looked upon as the potential intelligence within. Thus sensation arises. In later stages, when the consciousness is sufficiently evolved to cognize the connection between the exciting cause and the sensation, percepts arise—a recognition of the operation of the great law of cause and effect has taken place.

The whole process of evolution is but the traveling up on the one side of the circle of being, involution having marked the descent on the other side. But mark the difference: While involution deals with but the unified consciousness, force and substance, (in other words, with universal entity, bringing it to a stage where the one finally differentiates into the many), evolution starts in with that lowest stage of deific development, and in its upward march carries all these differentiated units of consciousness through the various stages which universal consciousness traversed in its descent, retracing the steps; thus gradually lifting the separate unit up to the highest level of deific consciousness and power. God sleeps in the atom. Man is a potential deity.

The Evolution of Life.

There are two phases of the law of evolution. Physical science has dealt largely with the objective side, the evolution of the form. That long list of brilliant men of science, culminating in Charles Darwin, who insisted upon evolution as a fact in nature, have forced the acceptance of their view by the thought of this age. Yet only the half-truth seems to have been fully caught. There is, as we have seen, an evolution of ever more complex forms, a refining of the nervous organism from the simple speck of protoplasm through all grades to the developed human being with his specialized nervous system. But why this evolution of form? It is not an end in itself. The evolution of form is only in order that the evolving life which animates the successive forms may have fuller means of expression, wider fields of activity, increased opportunities for coming into contact with the external world. The evolution of the conscious life is the great object of nature's effort. The evolution of the forms successively occupied thereby is but the modification of the objective rendered necessary by the progress of its subjective. Physical science, dealing too exclusively with the material, has been oblivious of the more important and basic spiritual, with the result that the philosophy of the one-sided evolution has, in its expression "the survival of the fittest," become the justification of the rule of might, of the oppression of the weak by the strong, of a forgetfulness of the great unity of the human race. Yet its tendency has been to rise gradually to a more exalted view of nature. Doctor Edward L. Youmans (introduction to "The Correlation and Conservation of Forces") indicates the fruits of progress in astronomic research; the tendency exhibited herein being, as he says, characteristic in a marked degree of all modern science: "The earliest explanations of the celestial movements were thoroughly and grossly material, and all astronomic progress has been toward more refined and ideal views. The heavenly bodies were at first thought to be supported and carried round in their courses by solid

revolving crystalline spheres to which they were attached. This notion was afterwards replaced by the more complex and mobile mechanism of epicycles. To this succeeded the hypothesis of Des Cartes who rejected the clumsy mechanical explanation of revolving wheel work, and proposed the more subtile conception of ethereal currents which constantly whirled around in vortices, and bore along the heavenly bodies. At length the labors of astronomers, terminating with Newton, struck away these crude devices, and substituted the action of a universal immaterial force. The course of astronomic science has thus been on a vast scale to withdraw attention from the material and sensible, and to fix it upon the invisible and supersensuous. It has shown that a pure principle forms the immaterial foundation of the universe. From the baldest materiality we rise at last to a truth of the spiritual world, of so exalted an order that it has been said 'to connect the mind of man with the Spirit of God.' "

The evolution of the soul is the complement of the evolution of the form, and in the complete philosophy thus made possible a rational basis of ethics is provided.

The Theosophic Teachings Summarized.

Those who are conversant with the Theosophical Teachings now flooding Western literature, will at once recognize how closely the most recent of scientific theories are, in the above respect, in accord with them.

In those teachings the manifested universe is regarded as the manifestation of a Divine Being through whose parts life energies play and consciousness functions, and force and substance bear mutual relations analogous to that seen in man himself. Not the idea of an extra-cosmic deity with which we are so familiar, and which, as presented to us by our theologians, has repelled many of the brightest intellects and noblest souls in all ages; but an intracosmic Being which permeates everywhere, includes everything, and in which, using the words of St. Paul, "We live and move and have our being." In the words of Alexander Pope,

"All are but parts of one stupendous whole,
Whose body nature is, and God the soul."

Mrs Anne Besant (the Ancient Wisdom p. 55) thus tersely summarizes the Theosophic teachings: "The word 'spirit-matter' is used designedly. It implies the fact that there is no such thing as 'dead' matter; all matter is living, the tiniest particles are lives.

"Science speaks truly in affirming: 'No force without matter, no matter without force,' they are wedded together in an indissoluble marriage throughout the ages of the life of a universe, and none can wrench them apart. Matter is form, and there is no form which does not express a life, and there is no life that is not limited by a form. Even the Logos, the Supreme Lord, has during manifestation the universe as His form, and so down to the atom.

"This involution of the life of the Logos as the ensouling force in every particle, and its successive enwrapping in the spirit-matter of every plane so that the materials of each plane have within them in a hidden, or latent condition, all the form—and force—possibilities of all the planes above them as well as those of their own—these two facts make evolution certain and give to the very lowest particle the hidden potentialities which will render it fit—as they become active powers—to enter into the forms of the highest beings. In fact, evolution may be summed up in a phrase: It is latent potentialities becoming active powers."

In Conclusion.

The extracts which we have gathered show that the experiments and discoveries of our scientific friends have led them to the following conclusions, namely: That Matter is fundamentally homogeneous, though temporarily assuming its Protean forms as it is subjected to the influence of the varying degrees of force: That there is one Force in the universe, though its rates of vibration and grades of expression are infinite in number, as it endeavors to swing all grades and forms of matter under the behest of its imperious Law; That there is a structural

unity based upon a common prototypal form: That all Consciousness is linked and bound together in an all-embracing whole whose myriad aspects serve to mark the path of evolution and to spur each individual member on to progress: That through the whole realm of nature the One Life pulsates and stirs the tiniest particle as well as the most complex organism. One Substance, One Force, One Form, One Consciousness, One Life: That each of these is but a varying aspect of one great Reality behind. Thus scientific imagination suggests and Theosophical doctrines assert. But a union of force, matter, form, life and consciousness, each within certain comparatively narrow limits, gives as a product, the human being, organic because of the interplay of these factors. Judging then from analogy, when we find these factors united on the universal scale of being, we are justified in coming to the conclusion that the product there is a Supreme Intelligence working within the manifested universe as its living organism. Indeed these are almost the exact words of the great surgeon and pathologist, Dr. Pirogoff, of St. Petersburg, who was regarded by his contemporaries as "the very incarnation of expert science and methods of thought." In his posthumous Memoirs he affirms his belief in "An intelligent Universe and the activity of forces working in it harmoniously and intelligently;" and states his conviction; That his Ego is "an embodiment of a common universal mind," "infinite and eternal; which rules and governs the ocean of life," "directing the forces and elements toward the formation of organisms."

There indeed Science and Religion find their common ground. By different routes they reach the same goal. The Brotherhood of Man and the Fatherhood of God are no longer mere phrases appealing to the emotions, for they are now recognized as statements of facts in nature.

Since we are all bound together in one common enterprise in which progress is hastened through the harmony of its parts, altruism becomes profound wisdom, selfishness a mark of ignorance, and the highest codes of ethics are the most scientific expression of nature's laws.

[The End.]

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